<u>Amendments to the Specification</u>:

On <u>Page 2</u>, please replace the third paragraph with the following rewritten paragraph:

--For this purpose, sensors that have a piezoelectric material have proven to be particularly useful. Using such sensors, it is possible to detect an environmental influence such as the reversible or irreversible deposit or accumulation of gases or particles in or on the sensor layer, for example. An adsorbed gas leads to a change ~~in the measurement~~ <u>of mass</u> of the sensor, for example as a film on the sensor, causing its vibration frequencies to change. The changes in frequency prove to be directly dependent on the amount of the adsorbed gas.--

On <u>Page 3</u>, please replace the second full paragraph with the following rewritten paragraph:

--A high-temperature ~~scale~~ <u>balance</u> having a piezoelectric material, such as langasite, for example, is known from US 6,370,955 B1. The frequency shift of the ~~scale~~ <u>balance</u> is observed in order to determine a change in a high-temperature environment by means of material deposited on the scale.--

On <u>Page 3</u>, please replace the third full paragraph with the following rewritten paragraph:

--A disadvantage of this ~~scale~~ balance is that only the amount of the deposited material can be measured.--

Please replace the paragraph bridging Pages 3 and 4 with the following rewritten paragraph:

--A piezoelectric resonator is known from WO 97/45723, ~~in~~ onto which excitation electrodes of different sizes are disposed, in order to excite the resonator to vibrate. In this connection, one of the electrodes can be covered by a polymer layer. The resonator is introduced into an organic solution, in order to detect chemical substances in it, whereby a change in the conductivity of the polymer layer and thereby in at least one resonance frequency and at least one anti-resonance frequency of the resonator is utilized. One disadvantage of this type of sensor is that it is designed only for the room temperature range. Another disadvantage is that polymer layers are used, so that only a limited bandwidth of environmental influences can be taken into consideration. Furthermore, it is disadvantageous that at least one resonance frequency and at least one anti-resonance frequency must be determined, in order to determine the type and the extent of the environmental influence, respectively, thereby making significant measurement technology structures and computer capacities necessary.--

Please replace the paragraph bridging Pages 5 and 6 with the following rewritten paragraph:

--The device according to the invention, in accordance with claim 1, and the method according to the invention, in accordance with claim 16, for detecting an environmental influence on a sensor, by means of a change in an electrical conductivity of a sensor layer of the sensor, are characterized, in comparison with the state of the art, in that only the resonance frequency of a fundamental tone needs to be determined, in order to determine the type and the extent of an environmental influence on the sensor. Furthermore, by selecting of suitable piezoelectric materials (e.g. langasit) it is possible to cover a large temperature range, i.e. from -60°C to 1000°C, preferably from -30°C or 0°C to 900°C or to 600°C, 500°C, 250°C, or 100°C, as long as the material does not demonstrate any phase transition in this range. Therefore, even temperatures of up to -200°C can be measured using the sensors according to the invention, ~~i.e.~~ and the sensors can be used in the stated temperature ranges, respectively.--

Please replace the paragraph spanning Pages 6 to 8 with the following rewritten paragraph:

--In the case of the arrangement according to the invention, in accordance with claim 22, two devices having the same construction, in accordance with claim 1 (or one of claims 1 to 15) are exposed to the same environmental influence, but whereby only the first device delivers data that reflect the type or the extent of the environmental influence, and the second device remains untouched by this environmental influence. If one now compares the resonance frequencies of the fundamental tones with one another, the effect of the environmental influence (e.g. changed oxygen partial pressure) and changed environmental conditions (e.g. temperature increased to 900°C) is reflected in the resonance frequency of the first device, whereas only the change in the environmental condition to be measured (i.e. the elevated room temperature of 600°C) is reflected in the resonance frequency of the fundamental tone of the second device. In this document, the environmental influence is therefore the variable to be measured using the sensor. In this document, environmental conditions are understood to be the general physical, chemical, or biological conditions to which the sensor is exposed, which can possibly also change the frequency behavior of the sensor. In the case of the measurement ~~device~~ arrangement according to the invention, the environmental conditions are measured as a reference value and eliminated in the measurement of the

environmental influence ~~that is~~ of interest. In this way it is possible, in very simple manner, to find out the effect of the environmental influence on the resonance frequency of the fundamental tone, without previously having to carry out standard measurements or reference measurements for the sensor. The arrangement according to the invention is therefore ready for a measurement immediately, even if environmental influences and environmental conditions have not been measured previously, and does not have to be compared with a reference curve in order to be able to determine the type or the extent of the environmental influence. Furthermore, mechanical stresses in the sensor element, for example, which occur due to temperature changes in two sensor devices, can be separated from the desired signal that results on the basis of the environmental influence.--

Please replace the paragraph bridging <u>Pages 8 and 9</u> with the following rewritten paragraph:

--It is advantageous to use an oscillator circuit as the excitation unit, thereby making ~~it more cost-advantageous to measure~~ <u>the measurement of</u> the environmental influence <u>more cost-advantageous</u>, or preferably, a network analyzer can be used, which records the entire resonance spectrum of the piezoelectric material, thereby also making available resonance frequencies of

other upper harmonics, for example, or also damping of the resonance, in order to carry out a simpler temperature compensation by using the upper harmonics, for example, or to determine the viscosity of a material that has been deposited on the sensor, by using the damping.--

Please replace the paragraph bridging Pages 10 and 11 with the following rewritten paragraph:

--Preferably, the first excitation electrode lies against the piezoelectric material with an area that is greater than or smaller than the area with which the second excitation electrode lies against the piezoelectric material. If this variant is selected, a sensor layer that has the same construction for both sensors can be selected for the arrangement according to claim 22, but in the case of the first sensor, it is disposed on the larger excitation electrode, and is exactly as large as this excitation electrode, and in the case of ~~the~~ a second sensor, it is disposed on the smaller excitation electrode, so that the sensor layer covers the smaller electrode completely, and beyond that also lies directly against a region of the piezoelectric material. In this manner, the result can be achieved that both sensors change their frequency behavior on the basis of general environmental conditions, but only the second sensor changes its frequency behavior on the basis of the environmental influence to

be measured. This is because the effective electrode area is increased by means of the environmental influence in the case of the second sensor. In the case of this electrode according to the invention, the piezoelectric material is excited by means of the electrode area that lies against the piezoelectric material, and also by means of the sensor layer, since the latter demonstrates increased conductivity because of the environmental influence, and therefore the potential applied to the excitation electrode extends to the sensor layer. Consequently, excitation of the piezoelectric material occurs also in this region of the sensor layer. In other words, the environmental influence results in an increased conductivity of the sensor layer, thereby causing the potential of the excitation unit to be applied in the sensor layer, as well, and thereby causing <u>vibrations of</u> the piezoelectric material to be excited ~~to vibrate~~ also by means of the sensor layer.--

On <u>Page 11</u>, please replace the second full paragraph with the following rewritten paragraph:

--It is advantageous if the excitation electrode(s) lie against the piezoelectric material with a circular area, so that <u>a</u> particularly simple production of the sensor is possible.--

Please replace the paragraph bridging Pages 12 and 13 with the following rewritten paragraph:

--In ~~another~~ additional embodiments of the invention, the area of the sensor layer can be changed in order to form a region of a sensor layer that is attuned to the opposite excitation electrode, by means of a change in geometry, for example as a ring element or a circular element. A change in resonance frequency can be brought about by means of this arbitrary change in the effective excitation area. Changes in resonance frequency can also be achieved in another manner, by means of varying the material of the sensor layer, in its entirety or only in segments. ~~This~~ These measures serve~~s~~ to adapt the sensor to specific environmental conditions, or to produce a clear measurement signal for the environmental influence to be measured, respectively. As an example, a frequency shift can be adjusted by means of ~~this~~ these variations in the area or the material of the sensor layer, which shift is adapted to specific temperature ranges or oxygen partial pressures to be measured.--

Please replace the paragraph bridging Pages 13 and 14 with the following rewritten paragraph:

--It is advantageous if ~~not only~~ apart from the resonance frequency of the fundamental tone ~~but~~ also at least one resonance frequency of upper harmonics and/or damping of the fundamental tone or the upper harmonic can be measured by means of the frequency measurement device, so that these are available for further evaluation. For example, temperature compensation can take place by using the resonance frequencies of the upper harmonics (e.g. as described in Phys. Chem. Chem. Phys., 2003: "High temperature bulk acoustic wave properties of langasite" by H. Fritze, O. Schneider, H. Seh, H.L Tuller, and G. Borchardt). Furthermore, damping of the resonance can be used in order to determine the mechanical properties, for example the viscosity, of materials deposited on the sensor, or of the sensor layer itself. The resonance frequencies of the upper harmonics can also be used to determine the type or the extent of the environmental influence.--

On Page 15, please replace the second full paragraph with the following rewritten paragraph:

--~~To~~ For measurement of a chemical or biological substance on the sensor layer (3) as an environmental influence, a material that changes its conductivity when the substance comes into contact with the material of the sensor layer must be used for

the sensor layer. This interaction of the substance with the sensor material results in a change in the mobility and/or the density of the charge carriers in or ~~on~~ at the surface of the sensor material.

On Page 15, please replace the third full paragraph with the following rewritten paragraph:

~~To~~ For measurement of a temperature change, a material must be used that changes its conductivity when it is heated or cooled. Semiconductors or ceramics are considered particularly ~~possible~~ for this purpose.--

On Page 16, please replace the first full paragraph with the following rewritten paragraph:

--There are essentially three possibilities for undertaking temperature compensation of measured frequencies. As the first possibility, piezoelectric materials can be used, which have a ~~temperature-compensating cross-section~~ temperature-compensated cut. As the second possibility, the temperature in the region of the measurement sensor can be measured by means of a thermometer or optical means, and subsequently the frequency shift due to the elevated temperature can be derived by "extrapolation," for example using the temperature coefficient. Third, ~~not only~~ apart

from the resonance frequency of the fundamental tone of the piezoelectric material, ~~but~~ also at least one resonance frequency of an upper harmonic can be determined, and a temperature-compensated frequency value can be calculated using these two resonance frequencies (as, for example, according to Phys. Chem. Chem. Phys., 2003: "High temperature bulk acoustic wave properties of langasite" by H. Fritze, O. Schneider, H. Seh, H.L. Tuller, and G. Borchardt).--

Please replace the paragraph bridging Pages 16 and 17 with the following rewritten paragraph:

--In one embodiment of the invention, two sensor elements are used, which are operated in a joint arrangement. The arrangement according to the invention, in accordance with one of claims 22 to 27, advantageously comprises two devices according to one of claims 1 to 15, which have the same construction with the exception of the position and size of the sensor layer, so that effects brought about by use of different piezoelectric materials, different excitation electrodes, different sensor layer materials, etc., do not have any influence on the measurement result. Because the structure is nominally identical except for the sensor layer position, the influences of the environmental conditions are eliminated, so that the desired

measured variable for the environmental influence is ~~lifted~~ singled out.--

Please replace the paragraph bridging Pages 17 and 18 with the following rewritten paragraph:

--The sensor device according to one of claims 27 to 31 can be structured with cylinder symmetry about an axis of symmetry. ~~In this connection~~ Therein, the piezoelectric material has the shape of a cylinder, a first and second excitation electrode have the shape of a circular disk, whereby their center points lie on the same axis of symmetry, and the third excitation electrode has the shape of a circular ring, the circle center point of which also lies on the common axis of symmetry, and the sensor layer has the shape of a circular disk and lies directly on the first excitation electrode, whereby the center point of the latter also lies on the common axis of symmetry.--

On Page 18, please replace the next-to-last paragraph with the following rewritten paragraph:

--~~Fig. 1b shows a top view of the sensor of Fig. 1,~~ Fig. 1b shows another embodiment of the sensor according to the invention, in section,--

On Page 18, please replace the last paragraph with the following rewritten paragraph:

--~~Fig. 1c shows another embodiment of the sensor according to the invention, in section~~ Fig. 1c shows a top view of the sensor of Fig. 1,--

On Page 19, please replace the fifth full paragraph with the following rewritten paragraph:

--Fig. 4 shows a schematic ~~side view~~ cross sectional view of a sensor device according to the invention.--

On Page 21, please replace the first full paragraph with the following rewritten paragraph:

--A top view of the sensor 5 of Fig. ~~1~~ 1a is shown in Fig. ~~2~~ 1c. The excitation electrodes 7,9 and the piezoelectric material 11 are disposed concentrically here.--

On Page 21, please replace the second full paragraph with the following rewritten paragraph:

--The conductivity of the sensor layer 3 can be varied by means of environmental influences. If the sensor 5 is exposed to an environmental influence, the conductivity of the sensor layer 3 changes. If the conductivity becomes greater, the potential

applied at the first excitation electrode 7 becomes effective in the entire region of the sensor layer 3, since these are connected with one another in electrically conductive manner. The piezoelectric material 11 is therefore excited directly by means of the first excitation electrode 7, as well as by means of a region of the sensor layer 3, which is now more electrically conductive, thereby increasing the "effective electrode area" ~~around~~ by the region of the sensor layer, which is now conductive. If a conductive sensor layer is present in the starting state, the conductivity can be reduced by means of an environmental influence to be measured, and thereby the effective electrode area can be reduced. The resonance frequency changes as a result of the change in the effective electrode area.--

On Page 25, please replace the first full paragraph with the following rewritten paragraph:

--Likewise, Fig. 2b shows the behavior of a reference sensor having the same construction, with open measurement points. As is evident from Fig. 2b, ~~there is~~ this shows hardly any change in resonance frequency ~~in this sensor~~ when the oxygen partial pressure drops.--

On Page 25, please replace the second full paragraph with the following rewritten paragraph:

--~~Temperature~~ A temperature compensation of the measured frequency values can take place as follows: The temperature prevailing in the region of the sensor 5 is measured e.g. by means of a thermometer or by means of optical methods. The effect that results from the increase in temperature can be calculated from the measured temperature, and can consequently be deducted from the measured frequency value. In this manner, a value for the resonance frequency of the fundamental tone is obtained, which is independent of the temperature and depends only on the oxygen partial pressure, and thereby the measured resonance frequency of the fundamental tone is temperature-compensated.--

Please replace the paragraph bridging Pages 29 and 30 with the following rewritten paragraph:

--If the sensor layers of the two sensors 5o, 5u of Fig. 3 are exposed to the same environmental influence, e.g. an electrolyte solution, the conductivity of the two sensor layers 3 is changed in the same manner. This has the result, in the case of the upper sensor 5o, that the effective electrode area changes and the frequency spectrum of the sensor 5o shifts. This has the

result, in the case of the lower sensor 5u, that while the conductivity of the sensor layer 3 changes, this does not have any influence on the frequency behavior of the sensor 5u, since the sensor layer 3 of the lower sensor 5u does not have any contact area with the piezoelectric material 11. In other words, the change in conductivity has no influence on the frequency spectrum of the piezoelectric material 11, because only the second excitation electrode 9 and the first excitation electrode 7 of the sensor 5u excite ~~the sensor~~ it to vibrate.--

Please replace the paragraph bridging Pages 30 and 31 with the following rewritten paragraph:

--Fig. 4 shows a schematic cross-sectional view of a sensor device according to the invention. The sensor device comprises a sensor having a cylinder of a piezoelectric material 11, a first 7 and a second 9 excitation electrode, as well as a sensor layer 3 that lies against the first excitation electrode 7 and the piezoelectric material 11. The second excitation electrode extends maximally over a region that is covered by the opposite first excitation electrode. The first excitation electrode is covered with the sensor layer that also extends onto the piezoelectric material. This sensor device furthermore has a third excitation electrode 27, which also lies directly against

the piezoelectric material 11. ~~In this connection~~ Therein, the third excitation electrode must cover at least the region that is covered only by the opposite sensor layer. Here, the excitation electrode 27 is configured in the shape of a circular ring, which is also disposed with cylinder symmetry, but other geometries are also possible, in order to adjust the vibration behavior.--

On Page 31, please replace the first full paragraph with the following rewritten paragraph:

--Lines 21 proceed from the three excitation electrodes 7, 9, 27, which come together in a switching means 29. Using the switching means 29, either the excitation electrodes 7 and 27 or the excitation electrodes 9 and 27 can be connected with one another in an electrically conductive manner.--

Please replace the paragraph bridging Pages 31 and 32 with the following rewritten paragraph:

--In ~~another~~ a further embodiment, the third excitation electrode can be composed of several separate third partial electrodes, and ~~be disposed~~ on the opposite area regions of the resonator, the same or different sensor materials and/or geometries can be disposed, in each instance. In this case of the division of the third excitation electrode into third partial

electrodes, the individual partial electrodes must be contacted separately, and carried to the outside electrically, so that a multi-pole switching means allows optional switching in of individual or several third partial electrodes. In this manner, controlled switching in of sensor regions having different functionality, for example specificity for environmental influences to be measured, or other response behavior, becomes possible.--

On Page 33, please replace the second full paragraph with the following rewritten paragraph:

--Switching between these two "sensors" or these two "sensor functions," respectively, takes place instantaneously, so that supplemental information about the type (~~about~~ via the conductivity) and the extent (~~about~~ via the mass deposit in or on the sensor layer) of the environmental influence is available.--